

## REMARKS

Claims 1-59 are presently pending. Claims 1, 40, 42 and 44 have been amended. Claims 57-59 have been added.

Applicant requests entry of the amendments which are fully supported by the specification and original claims and add no new matter. Support for the amendments can be found throughout the specification and drawings. For example, support for the amendment to claim 40 can be found at least at page 7, lines 8-14, and support for claim 57 can be found at least at page 16, lines 30-33.

Reconsideration of the present application in view of the amendments and remarks herein is requested.

### **Restriction Requirement**

In response to a restriction requirement made by the Examiner, a provisional election was made with traverse to prosecute claims 1-14 and 23-51, claims 15-22 and 52-56 being withdrawn from consideration by the Examiner. Applicant hereby affirms the election and maintains the traversal. The traversal is on the grounds that the Groups defined by the Examiner have not been shown to be distinct. Claims 1-14 and 23-51 are to a substrate processing apparatus comprising one or more radiation detectors. Claims 15-22 and 52-56 are to a method for monitoring substrate processing comprising detecting radiation. In order for a restriction to be proper it must be shown that either the apparatus as claimed can be used to practice another and materially different process or that the method as claimed can be practiced by another materially different apparatus or by hand. The Examiner states that the apparatus is distinct from the method because the method is not limited

to normalization. However, claim 15 section (c) recites "normalizing the sample signal... ." Therefore, the restriction as set forth by the Examiner, is not proper and should be withdrawn. Furthermore, it would not burden the Patent Office to examine both sets of claims. Both sets of claims are classified in the same class and subclass, see page 2 of the Office Action of April 12, 2000. Thus, it is respectfully requested that all pending claims be examined.

### Allowed Claims

Applicant notes with appreciation, the Examiner's indication that claims 23-29 are allowable and that claims 5-10, 32-34 and 39 contain allowable subject matter. The balance of the claims are also allowable for the reasons set forth below.

### Rejections under 35 USC 102(b)

#### Sun et al

The Examiner rejected claims 1, 2, 3, 14, 40, 41 and 43 under 35 USC 102(b) as being anticipated by U.S. Patent No. 5,664,066 to Sun et al, hereinafter Sun et al. Applicant traverses the rejection.

Claim 1, for example, is not anticipated by Sun et al. In order for a reference to anticipate a claim, the reference must disclose each and every element of the claim. Claim 1 is to a substrate processing apparatus comprising, inter alia, a signal analyzer adapted to normalize a property of a first radiation relative to a property of a second radiation. Sun et al does not disclose the claimed normalization. Instead, Sun et al discloses a method of canceling background information in data obtained from an optical spectrum produced by plasma in a reaction chamber. The reference

Addressed  
rejection  
(now  
under  
CA)

discloses detecting electromagnetic radiation emanating from the plasma within the chamber (Col. 10, ln.66-67; Col. 11, ln. 1-5), but does not disclose detecting a second radiation. Clearly, since there is no disclosed detection of a second radiation, Sun et al does not disclose normalizing a property of the first radiation relative to a property of the second radiation. Therefore, Sun et al does not disclose each and every element of claim 1 and does not anticipate the claim.

Applicant disagrees with the Examiner's contention that Sun et al teaches the claimed normalization in column 14, lines 1-9. The nearby average intensity value for a small range of channels,  $A_i$ , as recited in Sun et al (Col. 14, ln. 2), does not refer to a second radiation from the radiation source, as claimed in claim 1. As disclosed in Sun et al, each channel covers a different wavelength in the optical spectrum produced by the plasma in the reaction chamber (Col.13, ln. 45-48). Therefore it is clear that  $A_i$ , as used in the Sun et al reference, refers only to wavelengths in the optical spectrum produced by the plasma in the reaction chamber. Thus, the detection of only one radiation is disclosed, and normalization relative to a second radiation is not taught.

*of a 2nd radiation*

Claims 2, 3 and 14 depend from claim 1 and include all limitations of the claim from which they depend, and thus are not anticipated by Sun et al for at least the same reason as for claim 1.

Independent claim 40, as amended, is also not anticipated by Sun et al. Claim 40, as amended, is to a substrate processing apparatus comprising a chamber comprising, inter alia, a radiation source other than a plasma in a process zone in the chamber. Sun et al only discloses detecting an electromagnetic spectrum produced by a plasma in a chamber (Col. 11, ln.1). The reference does not disclose a radiation source other than a plasma in a process zone in the chamber, and therefore Sun et al does not anticipate claim 40.

Claims 41 and 43 depend from claim 40, and are allowable for at least the same reason as for the claim from which they depend.

Böbel et al

The Examiner rejected claims 1, 2, 4, 11, 44-46, 48 and 49 under 35 USC 102(b) as being anticipated by U.S. Patent No. 5,564,830 to Böbel et al, hereinafter Böbel et al. Applicant traverses the rejection.

Claim 1 is not anticipated by Böbel et al. Claim 1 recites a signal analyzer adapted to normalize a property of a first radiation relative to a property of a second radiation. In contrast, Böbel et al discloses a system for determining the thickness of a coating and for determining the temperature of a substrate. Böbel et al discloses detectors for detecting thermal radiation from a substrate and radiation reflected from a substrate. However, the reference does not disclose normalization as claimed in claim 1. Instead, Böbel et al discloses (e.g. in column 3 lines 30-35 and lines 45-48) normalizing a particular property relative to an initial value of that particular property. However, Böbel et al does not disclose-normalizing a property of a first detected radiation relative to a property of a second detected radiation. Thus, Böbel et al does not disclose that which is claimed in claim 1, and does not anticipate the claim.

Claims 2, 4 and 11 depend from claim 1, and are not anticipated by Böbel et al for at least the same reason as for the claim from which they depend.

In addition, claim 44 is not anticipated by Böbel et al. Claim 44 is to a substrate processing apparatus comprising, inter alia, a radiation modulator which controls a property of radiation from a radiation source in relation to the reference

signal. Böbel et al discloses a radiation source. However, Böbel et al does not  
disclose a radiation modulator which controls a property of a radiation from a radiation  
source in relation to a reference signal generated by a detector. The Examiner refers  
to elements 9 and 10 in Figure 1 of Böbel et al as meeting the radiation modulator.  
Applicant disagrees. Element 9 is a chopper and element 10 is a lock-in amplifier.  
Neither element 9 nor element 10 controls a property of the radiation in relation to a  
reference signal from the detector, as recited in claim 44. Thus, Böbel et al does not  
disclose each and every element of claim 44, and therefore does not anticipate claim  
44.

973a  
Clerk

Claims 45, 46, 48 and 49 are dependent from claim 44 and are not  
anticipated by the reference for at least the same reason as the claim from which they  
depend.

#### Betz et al

Claims 44, 45, 46, 48 and 49 were rejected by the Examiner under 35  
USC 102(b) as being anticipated by U.S. Patent No. 4,838,694 to Betz et al,  
hereinafter Betz et al. Applicant traverses the rejection.

Independent claim 44 is not anticipated by Betz et al because Betz et al  
does not disclose each and every element of the claim. For example, claim 44 recites  
a radiation modulator being adapted to receive a reference signal from a detector and  
control a property of a radiation in relation to a reference signal. Betz et al discloses  
an imaging interferometer that has a modulator (30) that modifies the intensity of a  
laser beam (column 4 lines 11-14). However, the modulator of Betz et al does not  
control a property of the radiation in relation to a reference signal. As recited in  
column 4, lines 14-17, "a signal line leads from the modulator to a data processing

system to provide the modulation frequency to be used for detection and noise reduction." Thus the modulator provides an output signal, comprising the modulation frequency with which the laser beam is modulated, to the data processing system. However, the reference does not disclose a reference signal generated by a detector that is used to control a property of the radiation from the radiation source. Therefore claim 44 is not anticipated by Betz et al.

Claims 45, 46, 48 and 49 depend from claim 44, and are not anticipated by the reference for at least the same reason as for claim 44.

#### Rejections under 35 USC 103(a)

##### Sun et al

The examiner rejected claim 42 under 35 USC 103(a) as being unpatentable over Sun et al. Applicant traverses the rejection.

Claim 42 depends from claim 40, which recites a radiation source other than a plasma in a process zone in a process chamber. As shown above for the 102(b) rejection of claim 40 based on Sun et al, Sun et al does not disclose a radiation source other than a plasma. Furthermore, ~~Sun et al fails to teach or suggest a~~ radiation source other than a plasma in the process zone. Absent a specific teaching or suggestion to modify the reference to use a radiation source other than a plasma, the Examiner cannot establish a prima facie case of obviousness. In addition, claim 42 recites a feedback controller adapted to maintain a property of the radiation at a substantially consistent level. Sun et al does not teach maintaining the radiation at a substantially constant level. Therefore, Sun et al does not render claim 42 unpatentable.

Böbel et al

The Examiner has rejected claims 12, 13, 38 and 51 under 35 USC 103(a) as being unpatentable over U.S. Patent No. 5,564,830 to Böbel et al. Applicant traverses the rejection.

Claims 12, 13, 38, and 51 are not obvious over Böbel et al. Each of claims 12, 13, 38 and 51 recite a radiation transmitting fiber capable of transmitting a radiation to a detector. Böbel et al does not teach a radiation transmitting fiber, nor does the reference suggest to one of ordinary skill that it would be desirable to use such a radiation transmitting fiber. In addition, it is not clear how such a fiber would be incorporated, since in Böbel et al the same radiation pathway is used to transmit a first radiation and a thermal radiation to a detector. Thus, Böbel et al does not render claims 12, 13, 38, and 51 unpatentable and the rejection is requested to be withdrawn.

Böbel et al in view of van Pham

The Examiner has rejected claims 12, 13, 30, 31, 35-38 and 51 under 35 USC 103(a) as being unpatentable over Böbel et al in view of U.S. Patent No. 4,776,695 van Pham et al, hereinafter van Pham et al. Applicant traverses the rejection.

Claims 12, 13, 30, 31, 35-38, and 51 are not obvious over Böbel et al in view of van Pham et al. Each of claims 12, 13, 30, 31, 35-38, and 51 recite a radiation transmitting fiber capable of transmitting a radiation to a detector. As discussed above, Böbel et al does not teach or suggest a radiation transmitting fiber. In addition, it is not clear how such a fiber would be incorporated in Böbel et al since

the same radiation pathway in Böbel et al is used to transmit a first radiation and a thermal radiation to a detector. van Pham et al teaches a fiber optic bundle capable of light transmission, but does not teach the transmission configuration set forth in the claims. Böbel et al specifically teaches an arrangement of the objective, filter, radiation splitters and lens that is made such that the thermal radiation and the reflected radiation of the light source are incident on both detectors (Col. 6, ln. 12-16). Thus, one of ordinary skill in the art would not have been motivated to replace the specific arrangement of Böbel et al with a fiber, absent clear suggestion to do so.

Furthermore, claims 12 and 13 depend from claim 1, and thus each include the limitation of a signal analyzer to normalize a property of the first radiation relative to a property of the second radiation. Since this normalization is not taught or suggested by Böbel et al, as discussed above, or by van Pham et al, claims 12 and 13 are not rendered unpatentable by Böbel et al. Also, claim 51 depends from claim 44, and thus includes the limitation of a radiation modulator which controls a property of the radiation in relation to a reference signal. Böbel et al and van Pham et al do not teach or suggest this feature and therefore do not render claim 51 unpatentable for this additional feature.

*Michael*

#### **Claims 47 and 50**

Claims 47 and 50 were not specifically addressed in the body of the Office Action mailed on April 12, 2000. Accordingly, Claims 47 and 50 are believed to be allowable.



**N w Claims**

Claims 57-59 have been added to define additional aspects of the invention.


**CONCLUSION**

The claims are allowable at least for the reasons given above. The Examiner is respectfully requested to reconsider the present rejections and allow the pending claims. Should the Examiner have any questions, the Examiner is requested to call the undersigned representative of the Applicant.

Respectfully submitted,

JANAH & ASSOCIATES  
A PROFESSIONAL CORPORATION

Dated: July 26, 2000

By:   
Ashok K. Janah  
Reg. No. 37,487

Please direct telephone calls to:

Ashok K. Janah  
(415) 538-1555

Please continue to send all correspondence to:

Patent Counsel  
APPLIED MATERIALS, INC.  
P.O. Box 450A  
Santa Clara, California 95052